

LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLCS136C – AUGUST 1999 – REVISED APRIL 2000

- **2.7-V and 5-V Performance**
- **Low Supply Current:**
 LMV331 . . . 60 μ A Typ
 LMV393 . . . 100 μ A Typ
 LMV339 . . . 170 μ A Typ
- **Input Common-Mode Voltage Range Includes Ground**
- **Low Output Saturation Voltage . . . 200 mV Typ**
- **Package Options Include Plastic Small-Outline (D), Small-Outline Transistor (SOT-23 DBV, SC-70 DCK), and Thin Shrink Small-Outline (PW) Packages**

description

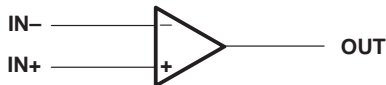
The LMV393 and LMV339 devices are low-voltage (2.7 V to 5.5 V) versions of the dual and quad comparators, LM393 and LM339, which operate from 5 V to 30 V. The LMV331 is the single-comparator version.

The LMV331, LMV339, and LMV393 are the most cost-effective solutions for applications where low-voltage operation, low power, space saving, and price are the primary specifications in circuit design for portable consumer products. These devices offer specifications that meet or exceed the familiar LM339 and LM393 devices at a fraction of the supply current.

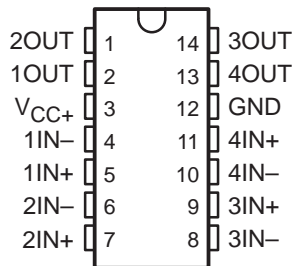
The LMV331 is available in the ultra-small DCK package, which is approximately one-half the size of the five-pin DBV package. The DCK package saves space on printed circuit boards and enables the design of small portable electronic devices. It also allows the designer to place the device closer to the signal source to reduce noise pickup and increase signal integrity.

The LMV331I, LMV339I, and LMV393I devices are characterized for operation from -40°C to 85°C .

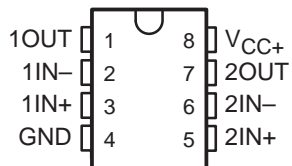
logic symbol (each comparator)



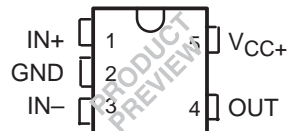
LMV339 . . . D OR PW PACKAGE
(TOP VIEW)



LMV393 . . . D OR PW PACKAGE
(TOP VIEW)



LMV331 . . . DBV OR DCK PACKAGE
(TOP VIEW)



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2000, Texas Instruments Incorporated

LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLCS136C – AUGUST 1999 – REVISED APRIL 2000

AVAILABLE OPTIONS

T _A	PACKAGE TYPE	PACKAGED DEVICES		
		SINGLE	DUAL	QUADRUPLE
-40°C to 85°C	5-pin SOT	LMV331DCKR LMV331DBVR	— —	— —
	8-pin SOIC 8-pin TSSOP	— —	LMV393ID LMV393IPWR	— —
	14-pin SOIC 14-pin TSSOP	— —	— —	LMV339ID LMV339IPWR

The D package is available taped and reeled. Add the suffix R to the device type (e.g., LMV393DR). The DCK, DBV, and PW packages are only available left-end taped and reeled.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V _{CC+} (see Note 1)	5.5 V
Differential input voltage, V _{ID} (see Note 2)	±5.5 V
Input voltage range, V _I (either input)	0 to 5.5°C
Operating virtual junction temperature range	0 to 150°C
Package thermal impedance, θ _{JA} (see Notes 3 and 4):	
D (8-pin) package	97°C/W
D (14-pin) package	86°C/W
DBV package	347°C/W
DCK package	389°C/W
PW (8-pin) package	149°C/W
PW (14-pin) package	113°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or PW package	260°C
Storage temperature range, T _{stg}	-65 to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values (except differential voltages and V_{CC+} specified for the measurement of I_{OS}) are with respect to the network GND.
 2. Differential voltages are at IN+ with respect to IN-.
 3. Maximum power dissipation is a function of T_{J(max)}, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} - T_A)/θ_{JA}. Selecting the maximum of 150°C can affect reliability.
 4. The package thermal impedance is calculated in accordance with JESD 51.

recommended operating conditions

	MIN	MAX	UNIT
V _{CC+} Supply voltage (single-supply operation)	2.7	5.5	V
T _A Operating free-air temperature	-40	85	°C

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLCS136C – AUGUST 1999 – REVISED APRIL 2000

electrical characteristics at specified free-air temperature, $V_{CC+} = 2.7\text{ V}$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage		25°C		1.7	7	mV
$\alpha_{V_{IO}}$	Average temperature coefficient of input offset voltage		-40°C to 85°C		5		$\mu\text{V}/^\circ\text{C}$
I_{IB}	Input bias current		25°C		10	250	nA
			-40°C to 85°C			400	
I_{IO}	Input offset current		25°C		5	50	nA
			-40°C to 85°C			150	
I_O	Output current	$V_O \leq 1.5\text{ V}$	25°C	5	23		mA
	Output leakage current		25°C		0.003		μA
			-40°C to 85°C			1	
V_{ICR}	Common-mode input voltage range		25°C	-0.1 to 2			V
V_{SAT}	Saturation voltage	$I_O \leq 1\text{ mA}$	25°C		200		mV
I_{CC}	Supply current	LMV331†	25°C		40	100	μA
		LMV393 (both comparators)	25°C		70	140	
		LMV339 (all four comparators)	25°C		140	200	

† This device is product preview.

switching characteristics, $T_A = 25^\circ\text{C}$, $V_{CC+} = 2.7\text{ V}$, $R_L = 5.1\text{ k}\Omega$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation delay, high- to low-level output switching	Input overdrive = 10 mV		1000		ns
		Input overdrive = 100 mV		350		
t_{PLH}	Propagation delay, low- to high-level output switching	Input overdrive = 10 mV		500		ns
		Input overdrive = 100 mV		400		

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

LMV331 SINGLE, LMV393 DUAL, LMV339 QUAD GENERAL-PURPOSE LOW-VOLTAGE COMPARATORS

SLCS136C – AUGUST 1999 – REVISED APRIL 2000

electrical characteristics at specified free-air temperature, $V_{CC+} = 5\text{ V}$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
V_{IO} Input offset voltage		25°C		1.7	7	mV
		-40°C to 85°C			9	
$\alpha_{V_{IO}}$ Average temperature coefficient of input offset voltage		25°C		5		$\mu\text{V}/^\circ\text{C}$
I_{IB} Input bias current		25°C		25	250	nA
		-40°C to 85°C			400	
I_{IO} Input offset current		25°C		2	50	nA
		-40°C to 85°C			150	
I_O Output current	$V_O \leq 1.5\text{ V}$	25°C	10	84		mA
Output leakage current		25°C		0.003		μA
		-40°C to 85°C			1	
V_{ICR} Common-mode input voltage range		25°C	-0.1 to 4.2			V
A_{VD} Large-signal differential voltage gain		25°C	20	50		V/mV
V_{SAT} Saturation voltage	$I_O \leq 4\text{ mA}$	25°C		200	400	mV
		-40°C to 85°C			700	
I_{CC} Supply current	LMV331†	25°C		60	120	μA
		-40°C to 85°C			150	
	LMV393 (both comparators)	25°C		100	200	
		-40°C to 85°C			250	
	LMV339 (all four comparators)	25°C		170	300	
		-40°C to 85°C			350	

† This device is product preview.

switching characteristics, $T_A = 25^\circ\text{C}$, $V_{CC+} = 5\text{ V}$, $R_L = 5.1\text{ k}\Omega$, $GND = 0\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL} Propagation delay, high- to low-level output switching	Input overdrive = 10 mV		600		ns
	Input overdrive = 100 mV		200		
t_{PLH} Propagation delay, low- to high-level output switching	Input overdrive = 10 mV		450		ns
	Input overdrive = 100 mV		300		

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.